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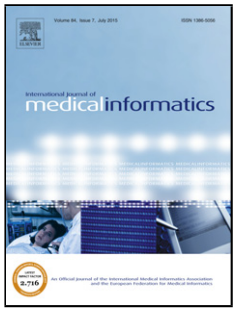

Title: Acceptance Model of a Hospital Information System

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Acceptance Model of a Hospital Information System

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HIGHLIGHTS

- The HIS user acceptance model is developed
- The model is focusing on human, technological, and organizational characteristics
- Hospital managers, doctors, nurses, and administrative staff are involved
- Human and organizational characteristics have greater influence on the user
- This model is best suited for government-owned hospitals in Indonesia

Abstract

Purpose: The purpose of this study is to develop a model of Hospital Information System (HIS) user acceptance focusing on human, technological, and organizational characteristics for supporting government eHealth programs. This model was then tested to see which hospital type in Indonesia would benefit from the model to resolve problems related to HIS user acceptance.

Method: This study used qualitative and quantitative approaches with case studies at four privately owned hospitals and three government-owned hospitals, which are general hospitals in Indonesia. The respondents involved in this study are low-level and mid-level hospital management officers, doctors, nurses, and administrative staff who work at medical record, inpatient, outpatient, emergency, pharmacy, and information technology units. Data was processed using Structural Equation Modeling (SEM) and AMOS 21.0.

Results: The study concludes that non-technological factors, such as human characteristics (i.e. compatibility, information security expectancy, and self-efficacy), and organizational characteristics (i.e. management support, facilitating conditions, and user involvement) which have level of significance of $p < 0.05$, significantly influenced users' opinions of both the ease of use and the

benefits of the HIS. This study found that different factors may affect the acceptance of each user in each type of hospital regarding the use of HIS. Finally, this model is best suited for government-owned hospitals.

Conclusions: Based on the results of this study, hospital management and IT developers should have more understanding on the non-technological factors to better plan for HIS implementation. Support from management is critical to the sustainability of HIS implementation to ensure HIS is easy to use and provides benefits to the users as well as hospitals. Finally, this study could assist hospital management and IT developers, as well as researchers, to understand the obstacles faced by hospitals in implementing HIS.

Keywords: hospital, hospital type, hospital information system, user acceptance, structural equation modeling

1. INTRODUCTION

Health remains one of the major issues in the world as set forth in the Sustainable Development Goals (SDGs) for 2015 to 2030 [1]. In order to support the SDGs, optimum service support from all parties and stakeholders involved in both government and private institutions is urgently required. The Ministry of Health of the Republic of Indonesia has launched a program called eHealth as part of the implementation of Law No. 14, passed in 2008, regarding Public Information, and the Regulation of the Minister of Health No. 1691/Menkes/Per/VIII/2011, regarding the Safety of Hospital Patients. The eHealth program can be performed if all hospitals at the provincial and regional levels have implemented the Hospital Information System (HIS). The HIS can automate business processes in a hospital.

The Ministry of Health of the Republic of Indonesia has defined the Action Plan Strengthening, or roadmap, for the HIS from 2011 to 2014. It prescribes phases of activity in the development of a "National Health Data Repository" enabling the accommodation of all the health data from various data sources [2]. The National Health Data Repository is expected to overcome the following

obstacles: duplication of health data, overlapping activities between different units and health agencies, and unsustainable and inefficient use of resources. To date, the government has only formulated one HIS implementation guide for hospitals to report to the Ministry of Health of the Republic of Indonesia as set forth in the Minister of Health Regulation No. 1171/Menkes/Per/VI/2011 and the Minister of Health Decree No. 82, passed in 2013, regarding the HIS. However, these regulations have not been drafted properly for the development of the HIS. A few issues have limited the effectiveness of these regulations, such as the absence of harmonization and synchronization of the implementation of healthcare policy between the central and regional governments and the lack of provisions related to the governance of information technology (IT) in hospitals [3].

Furthermore, the HIS has lagged compared to business and industrial information systems in terms of IT use and the application of quality standards for patient satisfaction [4]. Unfortunately, there are limited research studies related to HIS user acceptance, especially in developing countries [5]. Yarbrough and Smith [6], Angelidis and Chatzoglou [7], as well as Ahlan and Ahmad [5] identified that the Technology Acceptance Model (TAM) has been widely used to investigate the user acceptance and user intentions of the HIS. Although several studies have employed TAM to explain users' intentions to use the HIS, this model is still very general and is not designed for any particular profession, because each profession has special contextual characteristics that may affect IT adoption behaviors [8]. Therefore, further support is recommended to determine external factors that may affect the original proposed construct of the TAM; this would enhance the knowledge of user acceptance regarding the HIS.

Ribiere et al. [4] classified HIS users as being internal (i.e., hospital managers, physicians or doctors, nurses, administrative staff, laboratory technologists, pharmacists, quality control technicians, cashiers, and others within a healthcare facility) and external (i.e., patients, patients' families, insurance providers, suppliers, and health service researchers). According to Ismail et al. [9], there are differences in user acceptance factors among six government-owned hospitals that have wholly or partially implemented the HIS. Finally, hospital management must face many challenges in managing operations at the hospital to be able to provide affordable, appropriate, and high-quality services. The

HIS should be able to adopt all activities undertaken by all users, starting from the planning process to the daily operational activities of the line staff at the hospital.

In general, based on ownership, hospitals in Indonesia can be divided into two groups: government-owned and privately owned hospitals [3]. Those types of hospitals have different HIS institutionalization processes [3]; thus, there are indeed differences in their human, technological, and organizational characteristics. Based on data published by the Ministry of Health of the Republic of Indonesia in 2011, out of 800 government-owned hospitals in Indonesia, less than 1 percent of those hospitals have developed the HIS. Even those hospitals only developed it partially [10]. Sadly, utilization of the HIS at those hospitals is not optimal because the HIS has not been utilized by all users, especially doctors and nurses. The same facts are also faced by privately owned hospitals. Kluge [11] mentioned that if the hospitals cannot fully use the HIS to manage information exchange and enhance healthcare services, they will lose their patients' trust. In addition, Chau and Hu [12] have attributed the different IT adoption behaviors of healthcare professionals to their unique characteristics, such as doctors having very strong professional autonomy in determining all decisions related to services provided in hospitals.

Therefore, this study aims to identify obstacles faced by hospitals in Indonesia by identifying a suitable HIS user acceptance model based on the characteristics of user groups in each hospital type (i.e., the entire hospital as well as in privately owned and government-owned hospitals). The results from this study will be compared among those types of hospitals to analyze human, technological, and organizational factors that can affect user acceptance of the HIS from the perspective of 1) users as a whole; 2) privately owned hospitals; 3) government-owned hospitals; and 4) regional government-owned hospitals. We performed a comparison to determine the most suitable model to be applied for resolving obstacles related to user acceptance of the HIS for each type of hospital. Thus, our research question is: What is the appropriate model for understanding user acceptance of the HIS based on the human, technological, and organizational characteristics within all types of hospitals, as well as in privately owned, government-owned, and regional government-owned hospitals?

This paper is organized as follows: Section 2 reviews the existing literature, and section 3 explains the conceptual model. Section 4 describes the research methodology. The results and discussions of

this research are subsequently elaborated on in sections 5 and 6. Section 7 explores the implications of this research, and the final section discusses conclusions and recommendations for future work related to this research.

2. LITERATURE REVIEW

2.1 Hospital Information System (HIS)

The Hospital Information System (HIS) is defined as the socio-technical subsystem of a hospital, comprising all information processing systems as well as the associated human or technical actors in their respective information-processing roles [13]. According to Chen and Hsiao [14], the HIS is an integrated information system that plays a key role in supporting hospital affairs through the use of appropriate hospital information technology. Handayani et al. [15] identify the HIS architecture, which covers the basic processes of hospitals, from administration to the payment processes within the emergency, inpatient, and outpatient units (Figure 1). Based on Figure 1, hospitals should at least implement the following HIS modules, which must also be integrated with back office and support modules [15]:

- Registration module: supports the integrated registration (admission, discharge, and transfer), scheduling, and queuing processes for inpatient, outpatient, and emergency room departments;
- Order Communication System (OCS) module: assists medical staff with medical procedures that need to be performed based on the current health of the patient. This module involves the medical record module and other supporting modules, such as laboratory and radiology;
- Medical records module: manages patient medical records (patient identification and numbering, diagnosis, and procedures);
- Billing module: supports the process of calculation and preparation of the bill (billing) and payments; and
- Emergency, inpatient, and outpatient unit modules: support the activities in the emergency, inpatient, and outpatient medical departments.

2.2 Technology Acceptance Model (TAM)

Davis [16] proposes TAM as an instrument to predict the likelihood of a new technology being adopted within a group or an organization. TAM is a model that has also been tested in healthcare to identify user acceptance factors and the relationships between factors [6, 17]. Melas et al. [17] showed that TAM predicts a substantial proportion of the intention to use clinical information systems.

According to Ajzen and Fishbein [18], TAM is considered an influential extension of the theory of reasoned action (TRA). According to Davis [16], TAM is often used to analyze individuals' acceptance of new technologies. TAM could explain why a user accepts or rejects information technology by adapting TRA [16]. According to Venkatesh and Davis [19], the main factors of the TAM model are perceived usefulness (PU) and perceived ease of use (PEOU). TAM specifies the causal relationships between perceived usefulness, perceived ease of use, and actual usage behavior. Perceived usefulness (PU) is the degree to which a person believes that using a particular system would enhance his or her job performance, while the perceived ease of use (PEOU) refers to the degree to which a person believes that using a particular system would be free of effort or the degree of ease associated with using the system [19]. However, TAM is limited in its inability to consider the influence of external variables and barriers to technology acceptance [6].

3. CONCEPTUAL MODEL

According to Handayani et al. [3], there are different processes of HIS implementation based on the characteristics of users in each hospital type, namely government-owned hospitals and privately owned hospitals. Therefore, it is important to better understand the acceptance factors that could influence user acceptance of the HIS in each type of hospital. There are several acceptance models that have been widely used to explain the user acceptance in the healthcare context, such as TAM and UTAUT [12,70]. In addition, according to Pai and Huang [21], TAM is still one of the most frequently tested models in Information System literature and has been applied in various samples of users and in a wide range of information technologies. Many scholars have revised the TAM to enhance its interpretation abilities [21].

Because HIS has been underutilized for more than 10 years, the focus of this study is to understand the user acceptance factors regarding HIS as a whole, since there are different practices on the implementation of HIS by the hospitals in Indonesia. Yarbrough and Smith [6], Angelidis and Chatzoglou [7], as well as Ahlan and Ahmad [5] identified that the Technology Acceptance Model (TAM) has been widely used to investigate the user acceptance and user intentions of the HIS. The main factor for using the TAM model in this study is that it has been proven and well accepted by many researchers for studies with a focus on user acceptance factors regarding HIS. Based on TAM, user acceptance is influenced by perceived usefulness and perceived ease of use; thus, we defined our proposed model by modifying the TAM model—adding additional factors in order to better understand the external variables regarding user technology acceptance. Other models in previous studies, such as Taiwan [14, 20, 21], Iran [22], Jordan [23], and Greece [7], will also be used to elaborate more deeply on the TAM model. Besides the TAM model, this study also uses the dimensions of technology, individual human actors, and organizations in determining the success of HIS implementation.

Handayani et al. [3] defined three factors of user acceptance regarding the HIS in Indonesia: self-efficacy, subjective norms or social influence, and management support. However, Yarbrough and Smith [6], as well as Angelidis and Chatzoglou [7], recommend the addition of exogenous variables related to user acceptance factors of humans, technologies, and organizations for developing countries. Connecting these exogenous variables with the variable perceived usefulness and perceived ease of use provide a detailed description of the factors that can have a significant impact on HIS user acceptance.

Perceived usefulness, or *performance expectancy*, is defined as the degree to which a person believes that using a particular system would enhance his or her job performance [24]. Users may feel that using the HIS can assist them in completing their work quickly and improving their job performance and productivity. In other words, as long as healthcare professionals perceive the HIS as a source of performance improvement, they become more willing to use the HIS [8]. *Perceived ease of use* and *effort expectancy* relate to the degree to which users believe that the HIS is easy to use or the degree to which a person believes that using a particular system would be free of effort [6]. The

proposed model will use a grouping of three dimensions, including human, technological, and organizational characteristics, which are also used by Yarbrough and Smith [6], Angelidis and Chatzoglou [7], Hsiao et al. [20], and Lee et al. [25].

Human characteristics are defined as the level of confidence that comes from users' experiences with the HIS. To date, many users have realized the importance of security issues for the application, as well as the importance of having IS/IT knowledge. Thus, human characteristics include factors such as compatibility with work processes, information security expectancy, users' self-efficacy with the HIS, and social influence. *Compatibility* is defined as the degree to which an innovation is perceived as being consistent with the existing values, needs, and experiences of potential adopters [14, 20]. Previous studies have found that compatibility is an important factor impacting the willingness of individuals to adopt technology [14, 20, 26, 27, 28, 29, 30]. *Information security expectancy* is defined as the degree to which a person believes that the HIS can manage information properly when confidential information cannot be viewed, stored, or manipulated by unauthorized persons [23, 31]. Therefore, an HIS that has complete and ease-of-use security features could further enhance its users' perceptions of the benefits and ease of use [23]. *Self-efficacy* is defined as the degree to which people believe that the better their understanding and knowledge regarding computers, the more likely they would feel comfortable using computers as a result of their confidence level [24]. Thus, self-efficacy influences user acceptance of the HIS, including the perceived benefits and ease of use [25, 26, 27, 28, 30, 32, 33, 34, 35]. *Social influence* is defined as people's perceptions of whether or not most people important to them would think they should perform the behavior in question. Social influence demonstrated a significant influence to the intentions of individuals using technology in previous studies by Holden and Karsh [36], Mohamadali and Garibaldi [37], Gagnon et al. [26], Lee at al. [25], Hsieh et al. [28], Kummer et al. [32], Antwi et al. [34], Sezgina and Yildirim [30], and Steininger et al. [38]. Therefore, eight hypotheses related to human characteristics can be derived as follows:

H1. Compatibility (COMP) significantly influences the perceived usefulness (PU) of the HIS

H2. Compatibility (COMP) significantly influences the perceived ease of use (PEOU) of the HIS

H3. Information security expectancy (ISE) significantly influences the perceived usefulness (PU) of

the HIS

H4. Information security expectancy (ISE) significantly influences the perceived ease of use (PEOU) of the HIS

H5. Self-efficacy (SE) significantly influences the perceived usefulness (PU) of the HIS

H6. Self-efficacy (SE) significantly influences the perceived ease of use of the HIS (PEOU)

H7. Social influence (SI) significantly influences the perceived usefulness (PU) of the HIS

H8. Social influence (SI) significantly influences the perceived ease of use (PEOU) of the HIS ()

Technological characteristics include factors relating to the capabilities of the HIS. Evaluation and measurement processes are required in order to improve the quality of the HIS, as well as information quality to improve customer satisfaction and user acceptance [39]. *Information quality* is defined as the degree of excellence of the information produced by the software or system, which focuses on issues related to the timeliness, accuracy, relevance, and format of the information produced by the system [40]. Mohamadali and Garibaldi [31] define *information quality* as the extent to which the information generated from the HIS has the attributes of the content, accuracy, and format that suit individuals' needs. Nguyen et al. [41] define *information quality* as exhibiting accuracy, completeness, timely access, availability, improving readability, and the ability to handle a lot of data or information attributes in order to manage patient information. Mohamadali and Garibaldi [37] and Hsiao et al. [20], among others [7, 9, 14, 21, 26, 27, 41, 42], state that the information quality influences user acceptance of the HIS through perceived usefulness and ease of use.

System quality is defined as the degree of excellence of the software or system and focuses on user interface consistency, ease of use, system response levels, system documentation and quality, ease of maintaining the programming code, and whether the system is free of bugs [24]. According to Mohamadali and Garibaldi [31], system quality can be measured based on the performance of the overall system. For example, if there are a lot of bugs in the system, the user will tend not to use the system, and the system cannot perform tasks according to the needs of its users. Therefore, system quality can influence user acceptance of the HIS through perceived usefulness and ease of use, according to Angelidis and Chatzoglou [7], Chang et al. [42], Chen and Hsiao [14], Gagnon et al. [26],

Holden et al. [43], Olson et al. [44], Lakbala and Dindarloo [45], Nguyen et al. [41], Sezgina and Yildirim [30], and Ismail et al. [9]. Therefore, there are four hypotheses related to technological characteristics that can be derived as follows:

H9. Information quality (IQ) significantly influences the perceived usefulness (PU) of the HIS

H10. Information quality (IQ) significantly influences the perceived ease of use (PEOU) of the HIS

H11. System quality (SQ) significantly influences the perceived usefulness (PU) of the HIS

H12. System quality (SQ) significantly influences the perceived ease of use (PEOU) of the HIS

Organizational characteristics include factors related to issues in organizations, such as management support or leadership for HIS planning and implementation, facilitating conditions, and user involvement in HIS implementation. *Management support* is defined as the degree to which management supports HIS development, as well as managements' attitudes about user acceptance or rejection of the HIS [14, 20, 26, 31, 32, 41, 46]. According to Mohamadali and Garibaldi [31], management should be able to provide an adequate working environment that can support and encourage its employees to innovate and improve working practices. To achieve that condition, hospital management should provide supporting facilities, such as complete and clear instructions for using the HIS in a user manual book and specialized units or personnel responsible for managing the HIS and its related resources (e.g., computers, laptops, and networks). In addition, management must also be responsible for influencing, coordinating, and directing the activities of its employees to achieve the goals and objectives of the organization. *Facilitating conditions* are defined as the objective factors in the environment that observers agree make an act easy to perform, including the provision of computer support. Ismail et al. [9] and Mohamadali and Garibaldi [37], among others [7, 21, 26, 27, 28, 34, 41, 47, 48], showed that facilitating conditions adequately enhance user acceptance of the HIS through perceived usefulness and ease of use. These facilitating conditions provide a user manual with clear instructions on how to use an application, specialized units, or personnel to manage the HIS, and adequate supporting resources (i.e., computers, laptops, and networks). *User involvement* in HIS implementation is defined as the active participation of HIS users in the communication,

design, implementation, and training processes of HIS implementation [23]. Al-Nassar et al. [23], Hackl et al. [49], Gagnon et al. [26], and Holden et al. [43] stated that user involvement in HIS implementation can increase customer satisfaction and user acceptance as well as impact the perceived usefulness and ease of use of the HIS. Thus, there are six hypotheses related to organizational characteristics that can be derived as follows:

H13. Management support (MS) significantly influences the perceived usefulness (PU) of the HIS

H14. Management support (MS) significantly influences the perceived ease of use (PEOU) of the HIS

H15. Facilitating conditions (FC) significantly influence the perceived usefulness (PU) of the HIS

H16. Facilitating conditions (FC) significantly influence the perceived ease of use (PEOU) of the HIS

H17. User involvement (UI) in HIS implementation significantly influences the perceived usefulness (PU) of the HIS

H18. User involvement (UI) in HIS implementation significantly influences the perceived ease of use (PEOU) of the HIS

Venkatesh and Davis [19] argue that the perceived usefulness and perceived ease of use positively influence user acceptance of a particular technology. When individuals perceive and experience the benefits of the HIS, they will positively accept and want to use the HIS; thus, it can improve individual performance [36]. The more easily the HIS can be used, the higher the user acceptance is [7, 14, 21]. In TAM, there is a relationship between the variables of perceived usefulness and perceived ease of use. In this proposed model, those two variables are not connected, since the focus of this study was to see the connection between external variables that can influence the variable perceived usefulness and perceived ease of use.

H19. Perceived usefulness (PU) of the HIS influences Hospital Information System Acceptance (HISA)

H20. Perceived ease of use (PEOU) of the HIS influences HISA

Figure 2 describes the conceptual model of HIS user acceptance, which consists of 12 variables and 44 indicators that are further explained in the Appendix. Each latent variable has a minimum of three indicators, such as variable compatibility (COMP), self-efficacy (SE), social influence (SI), facilitating conditions (FC), and a maximum of four indicators, including variable perceived usefulness (PU), perceived ease of use (PEOU), information security expectancy (ISE), information quality (IQ), system quality (SQ), management support (MS), user involvement (UI), and HIS acceptance (HISA).

4. METHODOLOGY

4.1. Research Method

This study is both qualitative and quantitative, using a questionnaire as the research instrument (Appendix 1). The results of the interviews will be used to understand HIS implementation in hospitals and to support the hypothetical results obtained from the questionnaires. The questions asked during the interview process cover the early years of HIS development, currently integrated HIS features, HIS integration, technologies and platforms used in the development of the HIS, methods of development for implementing the HIS, HIS management units, availability of IT planning, HIS users, and HIS acceptance factors. Furthermore, the interviews were recorded, transcribed, and coded to understand HIS implementations in these hospitals and find the importance of user acceptance factors regarding the HIS.

The case study in this research was conducted in four privately owned hospitals (B-class) and three government-owned hospitals (A-class) in Indonesia, which are general hospitals. The privately owned hospitals have obtained full national accreditation, and the government-owned hospitals have also earned full national accreditation as well as international accreditation from the Joint Commission International (JCI). The government-owned hospitals also function as teaching hospitals and were chosen due to their experience and knowledge of HIS implementation over the last 10 years. Interviews were conducted with the heads of IT in four privately owned hospitals and three government-owned hospitals in order to understand the history of HIS implementation. The hospitals' profiles are as follows:

- GH1: National referral hospital (government-owned hospital)
- GH2: Bali and Nusa Tenggara referral hospital (regional government-owned hospital)
- GH3: Central Java referral hospital (regional government-owned hospital)
- PH1: Privately owned hospital located in Central Jakarta
- PH2: Privately owned hospital located in West Java
- PH3: Privately owned hospital located in West Java
- PH4: Privately owned hospital located in Central Jakarta

With regard to the ethics of this study, we have obtained approval from the Ministry of Health and the Director General of Health Effort with 1) GH1 being identified by number LB.02.01/X.2/292/2015; 2) GH2 being identified by number LB.02.01./II.C5.D11/527/2016; and 3) GH3 being identified by number DL.00.02/1.II/776/2016. PH1, PH2 and PH3 are controlled under one group of hospitals and approved on 4th March 2015; PH4 is identified by number 341/Dirut/Ext/II/2015. Before the questionnaire was distributed, it was tested to identify errors and ambiguities in each statement by one of the hospital managers in the inpatient, outpatient, emergency, medical record, laboratory, and information technology units. Then, the questionnaires were distributed directly to the middle- and lower-level hospital managers, doctors, nurses, and administrative staff in those units. The samples were selected based on user experience and knowledge of the HIS in their work (purposive sampling).

Questionnaire data were analyzed using the Structural Equation Modeling (SEM) technique to examine the causal model. The reliability and validity of the measurement model were assessed by a confirmatory factor analysis using AMOS 21.0 software, and the maximum likelihood method was applied to estimate the parameters of the research model.

According to Hair et al. [50], data processing by SEM consists of model (path diagram) specification, choosing input matrix and model estimation techniques (this study uses Maximum Likelihood Estimation (MLE)), model identification (determination of the degree of freedom), data estimation (i.e., checking the sample size, the normality of the data, outliers, multicollinearity, and offending estimates), the measurement model test (test of validity, reliability, and overall suitability of

models to see the value Goodness-of-Fit (GOF)), a structural model test, and model modification. Figure 3 describes the steps of data processing using SEM and AMOS.

Data processing will be performed for the cumulative hospital data (GH1, GH2, GH3, PH1, PH2, PH3, & PH4), data from the privately owned hospitals (PH1, PH2, PH3, & PH4), data from the government-owned hospitals (GH1, GH2, & GH3), and data from the regional government-owned hospitals (GH2 & GH3). The results of processing for each group of data will then be analyzed and compared to the characteristics of the respondents from the cumulative hospital data.

4.2. Instruments

There are 44 statements in the questionnaire that contain all indicators in the Appendix, each of which should be scored by the respondents for importance. For each statement, a Likert scale of 1–5 is provided to rate each sub-dimension. Scale 1 is used to express a very unimportant sub-dimension, scale 2 is used to express an unimportant sub-dimension, scale 3 is used to express a neutral sub-dimension, scale 4 is used to express an important sub-dimension, and scale 5 is used to express a very important sub-dimension. A larger scale number chosen by the respondents indicated a higher level of agreement about the importance of the selected sub-dimension to be implemented in the hospital in order to increase the HIS user acceptance.

5. RESULTS

5.1. Respondent Demographics

The interviews were conducted with the IT heads of each hospital due to their responsibility in the management of the HIS. Questionnaires were distributed from March 4, 2015 until March 18, 2016. Of the 2,028 questionnaires distributed, 45 were incomplete; thus, the total valid data that could be processed totals 1,983 questionnaires.

Based on the level of organization at a given hospital, hospital management is divided into three levels, specifically, top management, middle management, and low management. Top management (e.g., director, deputy director, or director) is responsible for setting a hospital's strategic plan (long-term plan). Middle management (e.g., the installation or unit head) is responsible for implementing the

strategic plan and ensuring achievement at the hospital. Low management (e.g., Ward Manager) is responsible for implementing the action plan set by top management. However, the HIS is most frequently used by middle and lower management; thus, only middle and lower management filled out the questionnaire. Table 1 describes the respondent demographics.

5.2. HIS Implementation in Indonesian Hospitals

These hospitals (GH1, GH2, GH3, PH1, PH2, PH3, & PH4) implemented HIS over 10 years ago; however, HIS implementation is not optimal in terms of utilization or health services provided. The implementation stage of the HIS starts by making improvements to a hospital's network or infrastructure, which then allows for the development of a new HIS. In government-owned hospitals, the establishment of the IT unit was performed in conjunction with HIS development, while in privately owned hospitals, the establishment of IT units was carried out before the infrastructure and HIS development. Even today, the positions of the IT units in each hospital as well as the required positions in the IT units still vary due to the lack of IT governance-related policies in the hospital and from the Ministry of Health.

Based on the interviews with five heads of IT at GH1, GH2, GH3, PH1 and PH4 from 2000 until the present, those hospitals have implemented the HIS 1) partially, 2) without integrating the registration, medical records, online prescriptions, billing modules, and other related applications used in those hospitals, and 3) without features to meet user demands and requirements. HIS modules are widely implemented and used by those hospitals, especially the registration and billing modules, in order to process patients' claims. Those modules have been increasingly used since the National Health Insurance program has been launched by the government. This fact is evident from the results of interviews with the following individuals:

- Head of IT at PH1: *"... Registration, billing, and e-prescriptions are already more automated than manual."*
- Head of IT at GH1: *"The e-prescribing only links to several pharmacies. The HIS has not been thoroughly integrated with the Health Security Agency's applications to process patients' billing*

claims .... Until now, the IT implementation at this hospital is still focused on administrative records."

Only two hospitals (GH1 and PH1) are already using e-prescriptions in their emergency units to accelerate the process of administering medicine. However, only 10 percent of doctors use e-prescriptions, as shown in excerpts of interviews with the Head of IT at PH1:

"For modules associated with doctors have not been used, except for e-prescriptions that have been running for some doctors. Only 10 percent of physicians use e-prescriptions."

Other hospitals do not use e-prescriptions because, until now, the Ministry of Health has taken no policy stance on the legal basis for the use of electronic prescriptions, which makes doctors hesitant to use e-prescriptions. This situation is reflected in excerpts of interviews with the Head of IT at PH1:

"Each of the relevant departments, policies and clinical pathways are sometimes still playing catch up after the implementation of the application because of the urgent need of hospitals. For example, e-prescription should be used in the month of January, but the procedure has not been implemented there or followed. The most important thing is to use the application. Future applications will be analyzed based on the shortcomings of the applications used now during procedures."

Furthermore, the use of HIS throughout the hospital has not been optimal due to the limited number of users, especially doctors. This happens due to incomplete HIS policies as well as a lack of infrastructure and human resources.

There is one government-owned hospital that successfully encourages the participation of doctors using the HIS because that hospital has integrated the function of education and healthcare into the use of the HIS. The role of residents who enroll in the Specialist Education Program to help physicians and nurses to enter the patients' data is very important, making patients' medical records recordable in the HIS, as stated in the interviews with the Head of IT at GH1:

"Residents and nurses frequently use the HIS to enter the patients' medical data, which can be seen from the HIS log system."

This condition can also make residents accustomed to or dependent on using the HIS at the hospital where they work. In addition, in this hospital, hospital managers also set an example by using the HIS in every activity they do at the hospital. Thus, leadership and management support factors greatly

affect the successful implementation of the HIS in public hospitals, as seen in excerpts of interviews with the Head of IT at GH3:

"HIS implementation success factors require leadership…."

In addition, management programs are indispensable in changing the work culture of the hospital staff members who have become extremely familiar and comfortable doing all the registration activities manually. The Head of IT at PH1 explained that:

"E-prescriptions have not been fully used by more senior workers because it's hard to change habits from manual into digital activities."

Most HIS development is done independently to cope with the rapid changes happening in the health industry. Hospital management teams have been aware of the importance of the role of IT in supporting the provision of optimal healthcare services, which varies with each IT unit in each hospital to manage the HIS. However, the limitations and capabilities of human resources currently owned by hospitals have led to a lack of IT planning (e.g., IT Master Plan, IT Roadmap, and IT Governance). Only GH1, which has defined a hospital IT Master Plan, can be used as a reference point for hospitals developing the future of IT. These conditions are shown in the following interviews:

- Head of IT at PH1: *"We still only see as needed, yet do IT planning and budget planning."*
- Head of IT at GH2: *"All is still done on an ad-hoc basis because this unit has not had an IT Plan or an IT roadmap."*

A large IT investment requires hospitals to have careful, thorough planning to improve their organizational performance. In addition, IT planning needs to be supported by policies related to health (e.g., thorough formulation of clinical pathways and standard fares) so that IT development can be successfully implemented. Unfortunately, those conditions have not been met by all hospitals.

5.3. The Measurement Model

The data processing was performed using the SEM technique with AMOS 21.0. The SEM technique is used to analyze the causal relationship between HIS acceptance factors. Several requirements should be fulfilled before doing feasibility testing, such as identifying sample size, data normality, outliers, multicollinearity, and offending estimates [50]. Total valid data to be processed is

1,983 questionnaires. According to Table 2, these sample sizes comply with the recommendation made by Hair et al [50], which allows that the minimum sample size for using SEM is between 100 and 150 data points. After sample size requirements were fulfilled, data normality tests were done. Based on the normality test result, the data is not normally distributed because the critical ratio (CR) multivariate value is far from the normal distributed CR value, which is ±2.58 [68]. To solve this problem, the outliers were identified and deleted. In AMOS 21.0, outlier data can be identified by looking at p1 and p2 values of mahalanobis distance. Outlier data has p1 and p2 values < 0.001 [51]. After deleting outlier data, some variables still had CR skewness and kurtosis values below ±2.58. Therefore, the data set was still not normally distributed. Then, to solve this problem, a bootstrapping method was used to analyze data that was not normally distributed [52, 53, 54, 55, 56]. Cheung and Lau [57] recommended using 1,000 bootstrap samples in order to make the model fit better. Multicollinearity can be identified by looking at the value of correlation between indicators. If the value is greater than or equal to 0.9, it can be said that there is a multicollinearity problem [68]. In this case, there is no variable with multicollinearity issues. The last step before doing a measurement test is checking offending estimates, which can be done by looking at the variance value. If the value is negative, it means that there is an offending estimate. SEM requires no offending estimates in the data [68]. In this case, there was no negative variance. Therefore, the next step of SEM was done. After all the requirements were fulfilled, the next step was feasibility testing. There are two steps in feasibility testing: the measurement model test and the structural model test.

The measurement model test is done by measuring convergent validity by factor loadings and average variance extracted (AVE), discriminant validity by a correlation matrix and the squared root of average variance extracted, and reliability testing by composite reliability (CR) and Cronbach's alpha (CA). An indicator can represent its latent variable if it has factor loadings > 0.7 [58]. Thus, an indicator that has factor loadings < 0.7 should be deleted. At the end, all rested indicators had factor loadings > 0.7.

AMOS 21.0 applications cannot show AVE, CR, or CA values automatically; therefore, manual calculations should be done. Each variable has an AVE value > 0.5 [59, 60, 61], and the correlation

matrix shows that each variable has a higher squared root of average variance extracted value than its correlation with other variables [59], which can be seen in Appendix 2. AVE ranged from 0.588 to 0.873 (Table 3). A variable should have a CA value > 0.7 [59, 62], indicating high internal consistency and a CR value > 0.7, indicating that the measurement errors were relatively small [59, 63, 64]. Based on Table 3, CA ranged from 0.703 to 0.984. Composite reliability of variables or constructs ranged from 0.758 to 0.95 (Table 3). Therefore, the AVE, CR, and CA value of each variable has met all the requirements.

The structural model testing is done by measuring the goodness of fit (GOF), which is used to evaluate the fitness of a research model and the collected data. The GOF criteria used in this research are CMIN/df, RMSEA, NFI, CFI, GFI, TLI, and IFI (Hoyle, 1995). In the first test, the value of CMIN/df, RMSEA, NFI, CFI, GFI, TLI, and IFI do not meet the cut-off value of each criterion. It can be concluded that the model does not fit the data. To make the model fit, it should be modified by adding covariance between latent variables or between latent variables and error covariance until the model is deemed fit. Table 4 shows that RMSEA, NFI, CFI, GFI, TLI, and IFI values are a good or marginal fit, so the overall model is a fit despite the value of CMIN/df. The last step is hypothesis testing by evaluating the p value from the AMOS 21.0 output.

5.4. The Structural Model

Hypothesis testing is done by comparing the value of p with a significance level of 5 percent resulting from the features of the AMOS bootstrap confidence level. According to Efron and Tibshirani [65], if the level of significance of $p < 0.05$, then the hypothesis is accepted. However, if the significance level of $p > 0.05$, then the hypothesis is rejected. Table 5 shows that compatibility, information security expectancy, system quality, management support, and facilitating conditions influence perceived usefulness (H1, H3, H11, H13, & H15). Furthermore, compatibility, self-efficacy, information quality, management support, facilitating conditions, and user involvement support perceived ease of use (H2, H4, H6, H10, H14, H16, & H18). Finally, inconsistent with our hypotheses, the data shows that information security expectancy, social influence, and system quality have no significant effect on perceived ease of use (H4, H8, & H12). In addition, inconsistent with our

hypotheses, the data shows that self-efficacy, information quality, and user involvement have no significant effect on perceived usefulness (H5, H9, & H17). Only social influence has no influence on both perceived usefulness (H7) and perceived ease of use (H8). This study supports the TAM because the perceived usefulness and perceived ease of use influence HIS acceptance (H19 and H20). Finally, this study proved that human, technological, and organizational characteristics influence user acceptance of the HIS, as can be seen in Table 5. In other words, the proposed model is suitable to describe the connectivity among HIS user acceptance factors corresponding to the characteristics of hospitals in Indonesia.

6. DISCUSSION

Based on the result as described in section 5, there are influences from human, technological, and organizational characteristics on HIS user acceptance. There is a significant influence on compatibility, information security expectancy, system quality, management support, and facilitating conditions toward perceived usefulness of the HIS, as well as compatibility, self-efficacy, information quality, management support, facilitating conditions, and user involvement toward perceived ease of use of the HIS.

However, Table **5** shows that there are differences in the hypotheses' results for all hospitals, whether privately owned, government-owned, or regional government-owned hospitals data. From the total 20 hypotheses that were defined at the beginning, the aggregation of data across the hospitals resulted in 13 accepted and 7 rejected hypotheses. Privately owned hospital data indicated that there are only 9 hypotheses accepted and 11 rejected. Government-owned hospitals data showed 12 accepted hypotheses and 8 rejected. Data in the regional government-owned hospital showed there are 9 accepted hypotheses and 11 rejected. Only 5 hypotheses (H6, H7, H12, H19, & H20) have consistent results obtained for the whole data group.

a. Human Characteristics

Based on Table **5**, the compatibility (COMP) with perceived usefulness (PU) of the HIS has a value of $p < 0.05$, which means the hypothesis of this study is accepted. The more the HIS is in

line with the work habits and needs of users (compatible), the greater the benefits received from the HIS and the easier it will be to use the system. These results support the studies of Gagnon et al. [26] and Hsiao et al. [20]. However, the hypothesis did not hold at the regional government-owned hospitals because the majority of users adhere to the instructions given by the hospital management when using the HIS, as stated in the following interview with the Head of IT at GH2:

"…. decisions of HIS implementation are made ad hoc due to the management instructions"

All instruction from hospital management can provide benefits perceived by the user so that they accept the HIS even though the application is not necessarily suited to their needs.

The relationship between compatibility (COMP) with the perceived ease of use (PEOU) of the HIS produces a p value of < 0.05; therefore, we can conclude that the hypothesis is accepted for cumulative, privately owned, and regional government-owned hospital data. This condition illustrates that if the HIS is designed according to user requirements, the user will find it easier to use the HIS. Slightly different results are shown by the data from the regional government-owned hospitals, where the relationship between compatibility (COMP) with the perceived ease of use (PEOU) has a negative effect. Chen and Hsiao [14] found similar results, noting that most studies related to IT acceptance focused on factors that influence behavioral intentions in the phase prior to implementation, rather than the actual use after the implementation of IT, as was done in this study.

The relationship between information security expectancy (ISE) and the perceived usefulness (PU) of the HIS produces a value of $p < 0.05$, from which we can conclude that the hypothesis is accepted for the cumulative, privately owned, and government-owned hospital data. The HIS accesses a lot of sensitive data, such as personal information, physiological parameters, and health records. Therefore, two of the primary challenges of HIS implementation are information security and privacy concerns [66].

Hsu et al. [66] identified three important privacy-enhanced features that should be a concern of the hospital managers and HIS developers: 1) the secure transmission module that can prevent physiological information from being intercepted by malicious parties, 2) the privacy protection module that protects user privacy by applying a signature scheme, and 3) the access control module that ensures that only authorized users can access system resources, including community information,

personal health records, and knowledge bases. Unfortunately, the regional government-owned hospitals still only focus on access-level features. This can also increase the perceived ease of use of the HIS, since changes to the data can be easily tracked. As a result, medical personnel pay less attention to the data changes that occur in the HIS. This happened due to a lack of IT knowledge on the part of hospital management and staff. Many users still share a username and password with their colleagues to enter patient data, as indicated in the following interview with the Head of IT at GH3:

"...Sometimes doctors give their usernames and passwords to nurses or colleagues to enter patient data."

The relationship between the information security expected (ISE) by the user with the perceived ease of use (PEOU) of the HIS yields a p value of < 0.05, meaning that the hypothesis of this study is accepted for privately owned and government-owned hospitals. Access levels features implemented on HIS can also increase the ease of use of data change in the HIS. In this case, data changes can be tracked by the medical personnel who are not concerned about the data changes that occur in the HIS. However, the cumulative and regional government-owned hospital data reject this hypothesis because the knowledge of security issues related to the benefits provided by the HIS to the user in regional hospitals is still inadequate.

The relationship between self-efficacy (SE) with the perceived usefulness (PU) of the HIS yields a value of $p > 0.05$, indicating that the hypothesis is rejected for the cumulative, government-owned, and regional government-owned hospital data. These results reflect the findings of Chen and Hsiao [14], who state that most studies related to IT acceptance focused on factors that influence behavioral intentions in the phase prior to implementation. In contrast, this study considered actual use after IT implementation. Privately owned hospitals demonstrated a negative effect from the relationship between self-efficacy (SE) and perceived usefulness (PU). Respondents can benefit from the application even though they lacked confidence using the application. This condition occurs because users in privately owned hospitals have realized the importance of IT in their work. Respondents will be more confident in using the application if they have adequate knowledge about using the application, as shown in an excerpt of interviews with the Head of IT at PH1:

"...There needs to be a transition period that is sufficient. A process of socialization and training for the doctors and nurses should be done ahead of time so that they are more aware and motivated. The participation of nurses is also needed to motivate physicians to use the application..."

Therefore, training in privately owned hospitals is routinely scheduled at the beginning of implementation or if there is a change in the application.

The relationship between self-efficacy (SE) and the perceived ease of use (PEOU) yields a p value of < 0.05, so it can be concluded that the hypothesis is accepted for the cumulative hospital data. The higher a user's technological expertise, the higher a user's confidence using the HIS will become [67]. Individuals who have self-confidence will be more motivated in their ability to use the HIS in their work. Due to perceived training knowledge, these individuals already have adequate knowledge regarding information technology or the HIS. Moreover, individuals can compare their work with and without the HIS, improving the skills of the users and the ease with which they use the HIS. Hospital management should provide training in the use of the HIS to all users in order to increase user confidence in the HIS even if a user has never used a similar application. In the training, users can also be informed of the importance of changing from a work culture of manual record keeping to one accustomed to digitally recording all data. Interviews with the Head of IT at PH1 reflect this:

"…*it is difficult to change the habits of the user from manual to electronic and related competencies…"*

According to Esmaeilzadeh et al. [8], the differences between healthcare professionals and other user groups in terms of accepting new IT arise from a set of values, such as specialized training, professional autonomy, and professional work arrangements. In addition, Dillon et al. [67] argue that training is not only limited to the increase of technological knowledge. It should also deal with knowledge about how technology can affect the delivery of health services provided by the hospital. Users should also understand that there are three levels of interactivity that can be perceived from using the HIS, including technology as an enabler, technology as a partner of professionals, and users as operators.

Moreover, social influence has no impact on perceived usefulness or perceived ease of use for the cumulative, public, and regional government-owned hospital data because most of the hospitals' staff

members already know the importance of IT in supporting the operations of the hospital to improve its competitive values. This result is in line with the study of Angelidis & Chatzoglou [7]. However, privately owned hospitals and government-owned hospitals exhibited different results. In these hospitals, the relationship between social influences (SI) with the perceived ease of use (PEOU) of the HIS is negative. The role of colleagues is very important in bringing out the benefits of the HIS, but users do not necessarily feel the ease of using the HIS, especially doctors and nurses in privately owned and government-owned hospitals. Therefore, hospital management needs to develop HIS that is user friendly and apply the policy of rewards and punishments in the use of HIS, as shown in the following interview excerpt with the Head of IT at PH1:

".... success factors necessary so that all users want to use the HIS .... require a reward and punishment mechanism of management to use the HIS."

b. Technology Characteristics

Aside from human characteristics, technological characteristics also influence the perceived usefulness and perceived ease of use of the HIS. System quality provided by the HIS increases user acceptance of the HIS. A high-quality system will produce high-quality information. Hsiao et al. [20] and Pai and Huang [21] explain the importance of making all the necessary information available and easy to understand and ensuring that the information recorded in the application is up to date, as shown during the interviews with:

- Head of IT at PH1: *"If there is a minor error on the HIS, doctors do not want to use it."*
- Head of IT at GH3**:** *"The key factor is to make the HIS easier to use for doctors."*

Improving system quality of the HIS would help physicians understand patient conditions and provide effective support for their clinical activities [14]. In addition, the more the user agrees with the system quality, the more he or she perceives its benefits. Consequently, hospitals should pay more attention to the healthcare information system's stability, the information it provides, its information integration ability, and its flexibility, in order to improve the perceived usefulness.

Unfortunately, most hospitals in Indonesia do not have integrated and complete HIS features, prolonging HIS response time, especially during peak hours, resulting in less efficient patient care. Therefore, the information quality provided by the HIS becomes incomplete, and sometimes the data

are not accurate or up to date. This condition means that information quality (IQ) and perceived ease of use (PEOU) of the HIS do not mutually influence each other, which can be seen from the value of $p > 0.05$. This means we can conclude that the hypothesis is rejected for the cumulative, privately owned, and regional government-owned hospital data. Government-owned hospitals produced different results. This is because the HIS can make all necessary information available and easy to understand and ensure that the information recorded in the application is actualized at the right time, enhancing the benefits provided by the HIS. This condition is expected at government-owned hospitals, which handle more patients, especially from patient referrals.

Information quality (IQ) and perceived ease of use (PEOU) of the HIS interact, as can be seen from the p-value of < 0.05, meaning that the hypothesis is accepted for cumulative and government-owned hospital data. Similarly, Hsiao et al. [20] and Pai and Huang [21] state that, when implementing the HIS, it is important to note how to make all the necessary information available and easy to understand and to ensure that the information recorded in the HIS is up to date.

The system quality (SQ) and the perceived usefulness (PU) of the HIS do not have a significant influence, which can be seen from the value of $p > 0.05$, so the hypothesis of this study is rejected for the privately owned, government-owned, and regional government-owned hospital data. A culture that values the importance of IT in private hospitals has been embedded from the beginning so that the system quality does not affect the benefits provided by the HIS and the perceived ease of use of the HIS. The Head of IT at GH3 noted that, although changes to the HIS have been made a few times, users still support it and still use the HIS:

"…in general, users support the use of the HIS even though they often compare it with the vendor application because the transition process is not smooth."

For the cumulative data, this hypothesis is accepted, although the correlation is a negative one. These results indicate the quality of a good HIS. In terms of completeness and security features of the HIS, it does not necessarily provide good benefits for users. In addition, an HIS with complete information and features may not be easily understood by the user, who may feel the application is too complex to be used. This will then have an impact on the users, making them unable to recognize the benefits derived from the HIS [4]. The system quality (SQ) and the perceived ease of use (PEOU) of the HIS

have no significant influence, which can be seen from the value of $p > 0.05$. Hence, the hypothesis is rejected for the cumulative data. Even though the users are not satisfied with the system quality of the HIS, they still use it to help them with their work because they realize the benefits of using the HIS for the short and long term.

c. Organizational Characteristics

Management support (MS) and the perceived usefulness (PU) of the HIS have no significant influence, as can be seen from the value of $p > 0.05$, with the conclusion that the hypothesis is rejected for private hospitals and public, regional government-owned hospitals. A culture that values the importance of IT in private hospitals has been embedded from the beginning so that the system does not affect the quality of the benefits provided by the HIS. In addition, the private hospitals had more support from management during HIS implementation. However, management support to encourage the active participation of doctors to use the HIS needs to be further strengthened, as stated in an interview excerpt with the Head of IT at PH1:

"It is difficult to change the habits of doctors....but encouraging doctors to use the HIS can only come from the management."

Different results are shown for the cumulative and government-owned hospital data. Due to limited funding for HIS implementation faced by most government-owned hospitals, management support becomes critical for the success of HIS implementation and maintaining the sustainability of the HIS project in compliance with a predetermined business and IT plan. According to Chen and Hsiao [14], support from senior management will also ensure that sufficient capital and human and organizational resources are made available during the process of implementation, enabling physicians to satisfy clinical practice requirements, thus achieving system development efficacy. With management support, individuals will be more motivated to use the HIS so that the ease of use and perceived benefits of the HIS will be achieved. Furthermore, a high level of management support is required to overcome physicians' professional autonomy, since they are very sensitive to any upcoming changes in their work settings.

Facilitating conditions (FC), perceived usefulness (PU), and perceived ease of use (PEOU) have no influence, which can be seen from the p-value of < 0.05. This means that both hypotheses are

accepted for the cumulative and regional government-owned hospital data. The cumulative data indicate a negative correlation between the facilitating conditions and perceived ease of use. Adequate support facilities may not be able to provide benefits and allow users to use the HIS. For example, if a hospital has provided adequate computers and networks but is not supported by a high-quality HIS, then users may not recognize the benefits and ease of use of the HIS. Both hypotheses are rejected for the government-owned and privately owned hospital data. Strong support from the management of privately owned hospitals in the implementation of IT can be realized in the facilities with adequate support in the implementation of the HIS [7].

User involvement (UI) in the implementation of the HIS and the perceived usefulness (PU) have no influence, which can be seen from the value of $p > 0.05$. It can be concluded that this hypothesis is rejected for the cumulative, privately owned, and government-owned hospital data. Strong support from the management of private hospitals in the implementation of IT can be realized by involving users in the development process of the HIS [23]. However, the regional government-owned hospitals displayed a negative relationship between user involvement (UI) in the implementation of the HIS and the perceived usefulness (PU). Involving users may not result in the development of a HIS that can provide benefits to the users. The diverse educational backgrounds in a hospital need to be analyzed further by hospital management to select the right people to be involved in the development of the HIS. User involvement (UI) in the implementation of the HIS and perceived ease of use (PEOU) interact, which can be seen from the value of $p < 0.05$. Therefore, the hypothesis is accepted for the cumulative, government-owned, and regional government-owned hospital data. The complexity of business processes and the number of patients treated in government hospitals led to the need to involve all users in HIS implementation to facilitate the use of the HIS so that it meets the needs of all users. However, specifically in government-owned hospitals, the relationship between user involvement in the implementation of the HIS (UI) and perceived ease of use (EU) has a negative effect. Involving users may not result in the development of an HIS that is easier to use because of the diverse educational backgrounds of hospital employees. This needs to be analyzed further by hospital management for better user selection for the development of the HIS. Privately owned hospital data

indicate a rejection of this hypothesis because users in privately owned hospitals have realized the importance of adapting to HIS.

Based on Table **5**, perceived usefulness and perceived ease of use of the HIS influence HIS acceptance, supporting the TAM. When individuals feel that the benefits of the HIS are greater, they will positively receive the HIS and want to use it to improve the performance of individual work [36]. The more easily the HIS can be used, the higher the rates of user acceptance [7, 14, 21]. Based on an interview with the head and staff of an IT unit responsible for HIS implementation, many users consider an easy, simple system as a precondition for the acceptance of the HIS.

In summary, based on the results of the hypothesis, this model is more suitable for government-owned hospitals, where there are hypotheses accepted for individual, technological, and organizational characteristics. The fact that a hospital that implemented the HIS over 10 years ago has not been able to execute an integrated system thoroughly or engage all users, specifically medical staff, indicates that there is still a lack of attention on IT planning by the hospital management. More efforts need to be realized in order to transform the HIS into an integrated system, thus making the HIS widely used in the hospitals to achieve optimal health services. Having that said, individual and organizational factors provide significant influence on the acceptance of HIS, since policies on the use and implementation of HIS are not defined comprehensively. In the end, this will lead to poor quality of HIS. Even though the Ministry of Health, as the regulator, has instructed all hospitals to implement HIS, such instruction was not followed in regard to implementing policies on the usage of HIS or in regard to reward and punishment mechanisms for failure to implement the HIS. Since hospitals must be accredited, ideally, the implementation of HIS application should be included as one component for the hospital accreditation assessment to force the hospital to implement the HIS. The situation in government-owned hospitals is quite different than the privately owned hospitals. Most of the large privately owned hospitals in Indonesia have implemented the remuneration system that is associated with the use of HIS, resulting in greater utilization of HIS for providing health services. Further, most all users have realized the importance of technology in supporting their performance, although the existing HIS could not meet the needs of the users. It can be concluded from the hypotheses on the system quality and information quality are mostly rejected in all groups of data. This condition is also

supported by the results of interviews with the head of IT at each hospital. Although the hospital has performed several changes on HIS, users still use HIS, although it is still limited to administrative activities. The same results are also obtained for privately owned hospitals and regional government-owned hospitals.

Support from hospital management is very critical for the sustainability of HIS implementation, in particular for the hospitals that do not have sufficient funds and human resources. These facts were typically found in the hospitals in developing countries. Strong commitment from the hospital management needs to be secured to ensure the continuity of HIS implementation. Strong support from the hospital management can ensure that all work streams would be smoothly in place, from planning to training, as well as HIS evaluation. In addition, strong support from the hospital management can legitimize the HIS so that medical staff use HIS even in the absence of policies on HIS utilization. This type of legitimacy of HIS and other relevant regulations is indispensable. In order to develop HIS that is user friendly and creates benefits to the users, it should be designed to meet user requirements and expectations, for example, by involving users during the communication, design, and implementation phases of development. If HIS is suitable to the existing users' working environment, they will have more confidence to use HIS, increasing the users' acceptance on HIS in the long term.

7. IMPLICATIONS

This study shows that TAM works to describe HIS user acceptance, which was also shown in the previous studies [6, 7, 20, 25]. The relationship between perceived usefulness and perceived ease of use on HIS acceptance was revealed to be significant. This study suggested other external variables on the human, technological, and organizational characteristics suited to the hospital environment. Those variables can be seen as special features and properties of the HIS in particular.

Moreover, this study proved that human, technological, and organizational characteristics influence user acceptance of the HIS. Table **5** also explains that this model is more appropriate for government-owned hospitals in Indonesia, where there are representatives of factors for each group of human, technological, and organizational characteristics. Human characteristics consist of compatibility, information security expectancy, self-efficacy, and social influence.

Technological characteristics consist of information quality. Organization characteristics are composed of management support and user involvement. However, HIS users in the privately owned hospitals are only influenced by human characteristics. On the other hand, regional government-owned hospitals are influenced by human and organizational characteristics. Human characteristics consist of compatibility and self-efficacy. Organizational characteristics are composed of management support, facilitating conditions, and user involvement.

The hospital is a unit that cannot stand alone from other health units and must comply with health regulations issued by the government. Therefore, support from management is critical to the sustainability of HIS implementation. Users who have high confidence are likely to accept the HIS. In addition, the users in the hospital have also realized the importance of security issues in the HIS. Based on this analysis, hospital management should 1) improve the quality of the HIS by making it easy and safe to use, 2) undertake training and mentoring during HIS implementation to increase users' confidence, 3) determine a mechanism of reward and punishment for using the HIS, 4) participate in using the HIS in any activity in order to increase the motivation of the users, 5) provide data and information that are easily understood by the users, 6) develop the HIS in line with current users' needs (there is no major change to the existing work culture), and 7) evaluate the system on an ongoing basis. Therefore, hospitals should adapt their business processes into existing HIS to make HIS valuable for users.

8. CONCLUSION AND FUTURE WORKS

Based on the evaluation model of HIS acceptance, it can be concluded that human, technological, and organizational characteristics significantly influence the perceived benefits and perceived ease of use of the HIS. Most hospital management teams do not realize that non-technical factors such as human and organizational characteristics can influence user acceptance of the HIS. At the first launch of the HIS, the users are given training for operating the HIS. It is expected that those users can learn to use the HIS as well as understand the perceived benefits of the HIS independently or with the help of colleagues. If there are new employees, they can learn about the use of the HIS from their colleagues. Therefore, human characteristics are factors that could influence the perceived usefulness

and perceived ease of use of the HIS so that the users can accept the HIS. Hospitals can improve the acceptance of the HIS by providing ease of use of the HIS, such as system access facility support, HIS manuals, and training and socialization skills related to the use of the HIS. In addition, management support is critical to the sustainability of HIS implementation.

A limitation of this study is that it does not yet involve other important users beyond hospital employees, such as patients. Future work related to this study should gather user acceptance factors from external HIS users, like patients, to provide a complete map of the characteristics of the HIS users in Indonesia. Moreover, to increase the user acceptance of HIS, hence providing the optimal health services, this model could also potentially be tested in hospitals in other developing countries. Because of similar characteristics such as lack of funds and resources, and insignificant support or commitment from top management faced by hospitals as well as other health facilities in Indonesia, these hospitals could offer better understanding of the needs of HIS user groups to increase the acceptance of HIS.

SUMMARY POINTS

Summary of previous studies:

- Few studies investigate the HIS acceptance model, which is suited for Indonesia context
- Few studies compare the HIS acceptance model according to the hospital type in order to understand deeply the problem faced by each hospital type
- Few studies involved all internal HIS users, including hospital management, doctors, nurses, and administrative staff

Summary of this study:

- This study developed an HIS user acceptance model focusing on human, technology and organizational characteristics
- Respondents involved in this study are mid-level hospital managers, doctors, nurses, and administrative staff members who are working in medical records, inpatient, outpatient, emergency, pharmacy, and information technology units
- This study showed that non-technological factors, such as human and organizational characteristics, significantly influence users' opinions of the benefits provided by the HIS and the ease of use of HIS compared to technological factors
- This model is best suited for government-owned hospitals

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AUTHORS CONTRIBUTIONS

P.W.H. and A.N.H. are responsible for reviewing literature from previous research related to the HIS user acceptance factors and models. All authors designed the research methodology. A.A.P., I.C.H., P.I.S., and I.B. analyzed the questionnaire and data from interviews. P.W.H. and A.N.H made the discussion and implications sections as the result of analysis. All authors made critical revisions to the manuscript for important intellectual content. All authors approved the final version.

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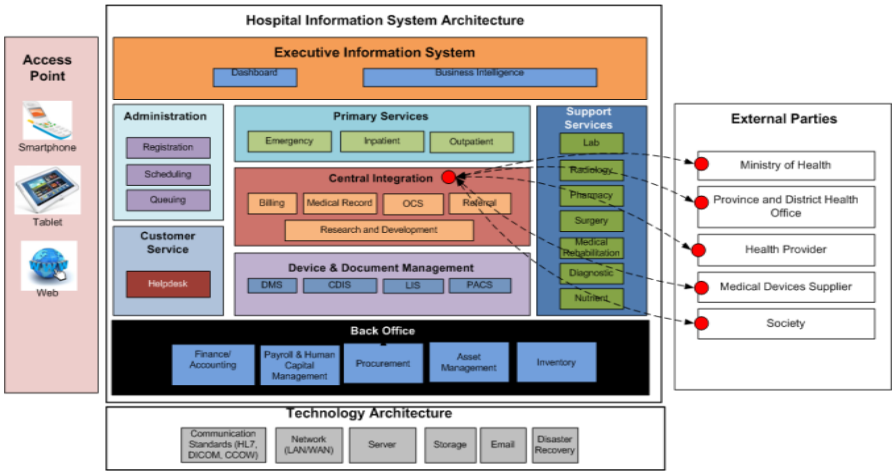

Figure 1 HIS Architecture [15]

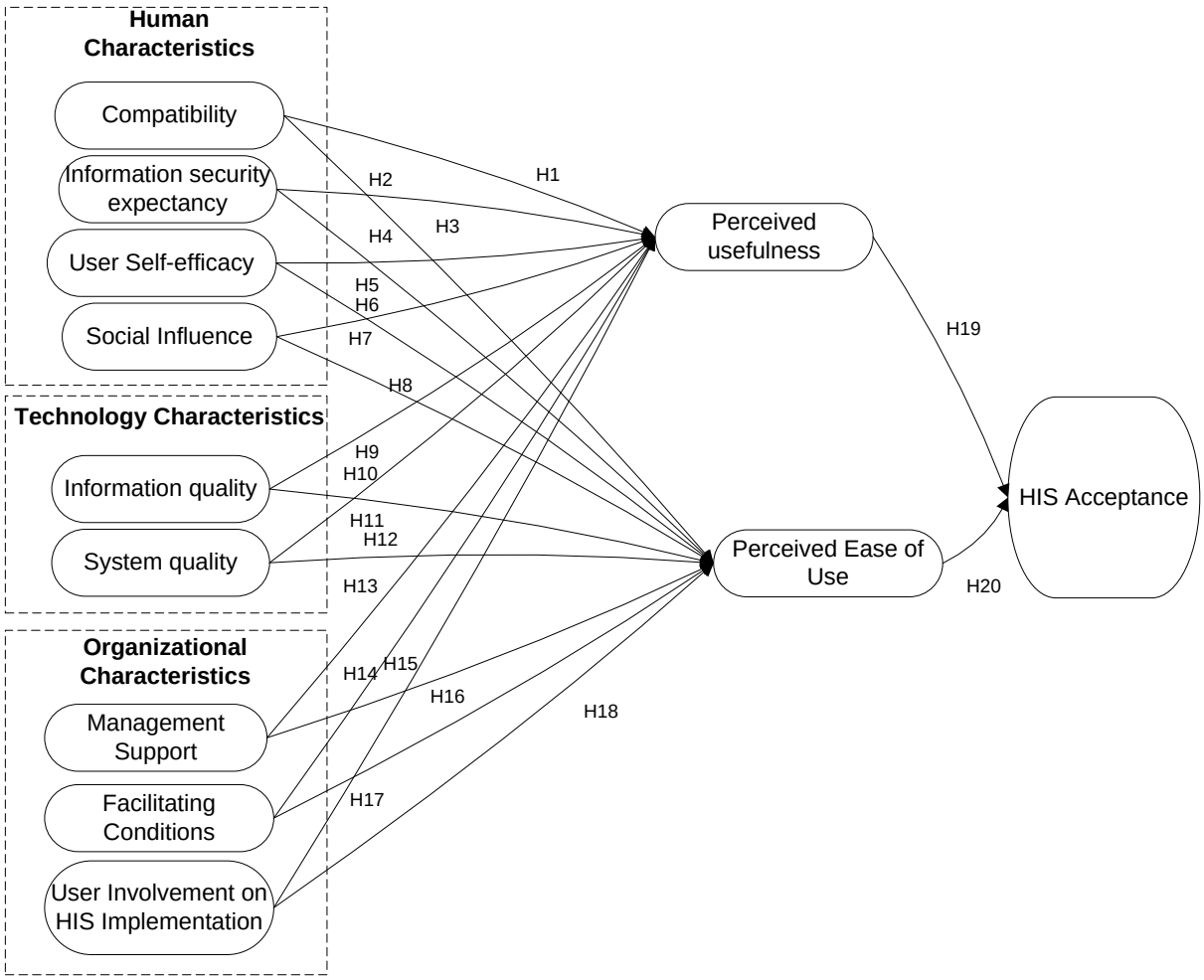

Figure 2 Conceptual Model of HIS User Acceptance

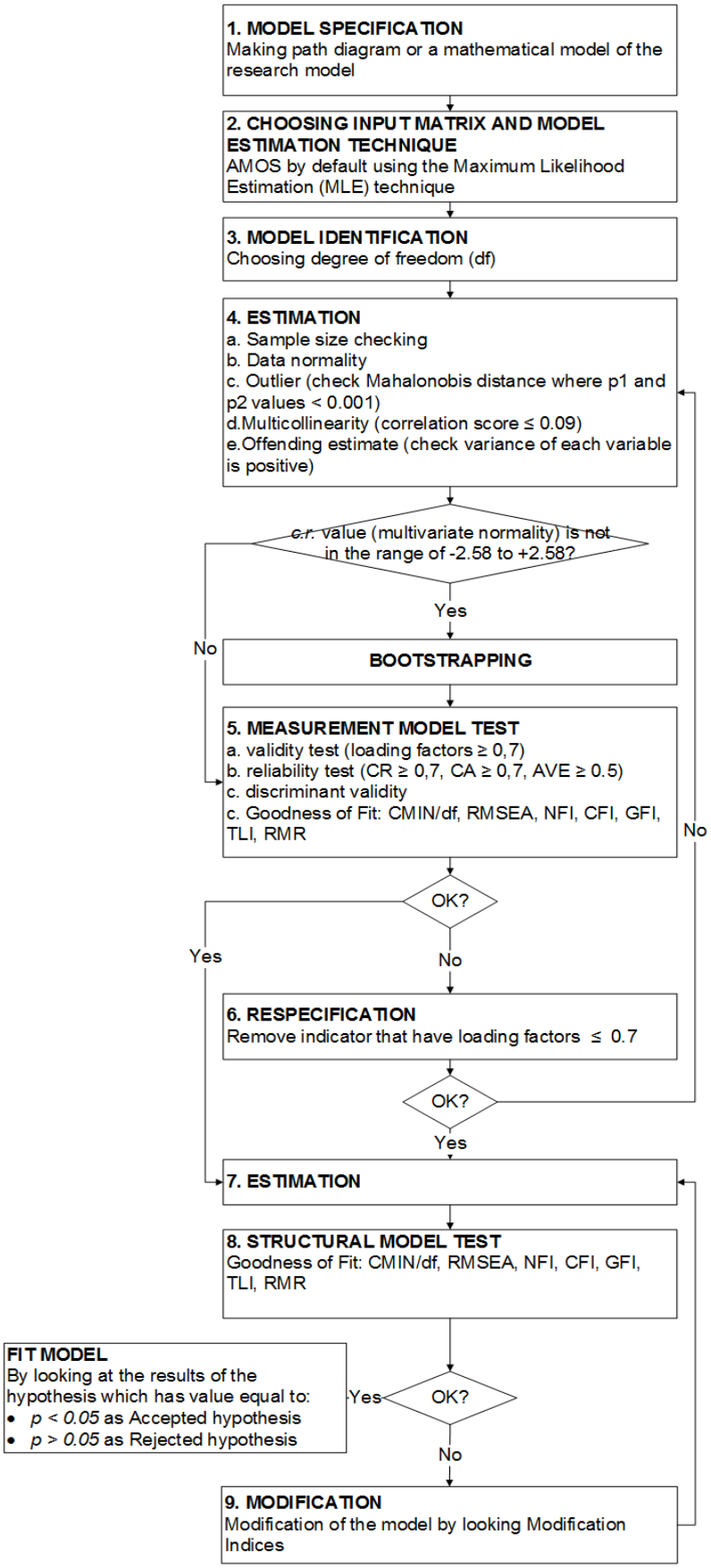

Figure 3 Steps of Data Processing using SEM and AMOS 21.0

Table 1 Respondent Demographics

Category	Total Number	%
Number of Completed Questionnaires Obtained at Each Hospital		
GH1	662	33.38%
GH2	199	10.03%
GH3	509	25.66%
PH1	160	8.06%
PH2	138	6.95%
PH3	97	4.89%
PH4	218	10.99%
Position		
Management	73	3.68%
Doctor	128	6.45%
Nurse	1,109	55.92%
Operator/Administrative Staff	558	28.13%
No Answer	115	5.79%
Gender		
Women	1,535	77.40%
Men	398	20.07%
No Answer	50	2.52%
Age		
< 20 years	25	1.26%
20 – 30 years	914	46.09%
30 – 40 years	463	23.34%
40 – 50 years	297	14.97%

> 50 years	200	10.08%
No Answer	84	4.23%
Education		
Senior High School	280	14.12%
Diploma/Vocational Degree	1,096	55.26%
Bachelor's	291	14.67%
Master's	25	1.26%
Resident	76	3.83%
Professional	94	4.74%
Specialist Doctor	16	0.80%
No answer	105	5.29%
HIS Frequency of Use		
Recently introduced to system	127	6.4%
Rarely use	356	17.95%
Frequently use	1,305	65.8%
No answer	195	9.83%

Table 1 Hospital Information System Implementation at Government-owned and Privately Owned Hospitals

	Government-owned Hospitals			**Privately Owned Hospitals**			
	GH1	**GH2**	**GH3**	**PH1**	**PH2**	**PH3**	**PH4**
Early Years of HIS Development	2010	2002	1994	2000	2000	2000	2000
Method Undertaken in Implementing the HIS	Joint Development	Joint Development	In-house Development	In-house Development	In-house Development	In-house Development	In-house Development
Availability of HIS Management Unit	Information System Management Unit	Electronic Data Processing Unit	Hospital Information System Unit	Electronic Data Processing Unit	Electronic Data Processing Unit	Electronic Data Processing Unit	Information Technology Unit
Availability of IT Planning	IT Master Plan	No IT Planning	No IT Planning	No IT Planning	No IT Planning	No IT Planning	No IT Planning
Currently Integrated HIS Features	Registration	Registration	Registration	Registration	Registration	Registration	Registration
	Billing	Billing	Billing	Billing	Billing	Billing	Billing
	E-prescriptions		E-orders	E-prescriptions			

	Government-owned Hospitals			Privately Owned Hospitals			
	GH1	**GH2**	**GH3**	**PH1**	**PH2**	**PH3**	**PH4**
			Pharmacy inventory				
HIS Users	Administrative Staff	Administrative Staff	Administrative Staff	Administrative Staff	Administrative Staff	Administrative Staff	Administrative Staff
	Nurses	Nurses	Nurses	Nurses	Nurses	Nurses	Nurses
	Residents		Pharmacy Staff	Doctors	Doctors	Doctors	Doctors
	Doctors		Doctors				
	Management		Management				

Table 2 Summary of Measurement Model Result

Requirements	Cumulative Hospital Data	Privately owned Hospital Data	Government-owned Hospital Data	Regional Government-owned Hospital Data
Hospital (Amount of Data)	PH1 (160 data points), PH2 (138 data points), PH3 (97 data points), PH4 (218 data points), GH1 (662 data points), GH2 (199 data points), GH3 (509 data points)	PH1 (160 data points), PH2 (138 data points), PH3 (97 data points), PH4 (218 data points)	GH1 (662 data points), GH2 (199 data points), GH3 (509 data points)	GH2 (199 data points), GH3 (509 data points)

Requirements	Cumulative Hospital Data	Privately owned Hospital Data	Government-owned Hospital Data	Regional Government-owned Hospital Data
Total Data Early	1,983	613	1,370	708
Normality Data (CR)	361.103	181.808	256.107	158.205
Normality Data (CR) without Outliers	114.785	85.039	82.062	58.423
Multicollinearity	No	No	No	No
Offending Estimates	No	No	No	No

Table 3 Result of AVE (Convergent Validity), CR and CA (Reliability Testing)

	Cumulative Hospital Data			Privately owned Hospital Data			Government-owned Hospital Data			Regional Government-owned Hospital Data		
	AVE	CR	CA	AVE	CR	CA	AVE	CR	CA	AVE	CR	CA
UI	0.686	0.814	0.813	0.685	0.897	0.896	0.873	0.932	0.932	0.710	0.830	0.830
FC	0.743	0.896	0.866	0.772	0.910	0.908	0.649	0.881	0.88	0.712	0.831	0.832
COMP	0.731	0.890	0.835	0.679	0.863	0.831	0.611	0.758	0.769	0.858	0.923	0.921
MS	0.707	0.905	0.703	0.747	0.922	0.748	0.646	0.845	0.847	0.623	0.768	0.775
SQ	0.745	0.921	0.904	0.745	0.921	0.921	0.719	0.911	0.91	0.741	0.848	0.820
IQ	0.766	0.929	0.928	0.770	0.931	0.931	0.751	0.855	0.828	0.658	0.883	0.920
SI	0.683	0.866	0.866	0.724	0.887	0.885	0.738	0.846	0.817	0.655	0.851	0.853
SE	0.694	0.870	0.815	0.687	0.866	0.825	0.743	0.849	0.822	0.588	0.810	0.806
ISE	0.709	0.907	0.906	0.751	0.923	0.921	0.712	0.832	0.832	0.689	0.898	0.897
PEOU	0.668	0.890	0.892	0.729	0.915	0.916	0.626	0.87	0.984	0.670	0.890	0.893
PU	0.705	0.905	0.907	0.739	0.919	0.920	0.673	0.892	0.891	0.670	0.879	0.879
HISA	0.769	0.930	0.929	0.825	0.950	0.950	0.718	0.91	0.91	0.743	0.920	0.919

Table 4 Model Evaluation Overall Fit Measurement

Goodness of Fit* (GOF) *Index	***Cut-off Value***	**Final value after modification of research model**			
		Cumulative Hospital Data	**Privately Owned Hospital Data**	**Government-owned Hospital Data**	**Regional Government-owned Hospital Data**
CMIN/df	< 2.0	5.260 (*Poor fit*)	3.229 (*Poor fit*)	4.158 (*Poor fit*)	2.594 (*Marginal fit*)
RMSEA	≤ 0.08	0.054 (*Good fit*)	0.07 (*Good fit*)	0.063 (*Good fit*)	0.053 (*Good fit*)
NFI	≥ 0.9	0.924 (*Good fit*)	0.877 (*Marginal fit*)	0.930 (*Good fit*)	0.915 (*Good fit*)
CFI	≥ 0.9	0.937 (*Good fit*)	0.911 (*Good fit*)	0.945 (*Good fit*)	0.946 (*Good fit*)
GFI	≥ 0.9	0.883 (*Marginal fit*)	0.8 (*Marginal fit*)	0.901 (*Good fit*)	0.883 (*Marginal fit*)
TLI	≥ 0.9	0.93 (*Good fit*)	0.899 (*Marginal fit*)	0.934 (*Good fit*)	0.936 (*Good fit*)
RMR	≤ 0.05	0.027 (*Good fit*)	0.035 (*Good fit*)	0.043 (*Good fit*)	0.032 (*Good fit*)

Table 5 Results of Hypotheses Testing

Hypothesis	Parameter			Results of Hypothesis Testing											
				Cumulative Hospital Data			Privately Owned Hospital Data			Government-owned Hospital Data			Regional Government-owned Hospital Data		
				Estimate	p	Result	Estimate	p	Result	Estimate	p	Result	Estimate	p	Result
H1	PU	<---	COMP	**0.791**	**0.002**	**Accepted**	**0.596**	**0.004**	**Accepted**	**0.15**	**0.002**	**Accepted**	0.037	0.78	Rejected
H2	PEOU	<---	COMP	**0.653**	**0.003**	**Accepted**	**0.768**	**0.003**	**Accepted**	0.045	0.102	Rejected	**-0.359**	**0.03**	**Accepted**
H3	PU	<---	ISE	**0.276**	**0.001**	**Accepted**	**0.352**	**0.006**	**Accepted**	**0.37**	**0.003**	**Accepted**	0.076	0.65	Rejected
H4	PEOU	<---	ISE	0.043	0.379	Rejected	**0.222**	**0.03**	**Accepted**	**0.089**	**0.049**	**Accepted**	-0.381	0.06	Rejected
H5	PU	<---	SE	-0.039	0.057	Rejected	**-0.151**	**0.031**	**Accepted**	0.036	0.56	Rejected	0.08	0.66	Rejected
H6	PEOU	<---	SE	**0.08**	**0.002**	**Accepted**	**0.189**	**0.025**	**Accepted**	**0.372**	**0.003**	**Accepted**	**0.636**	**0.04**	**Accepted**
H7	PU	<---	SI	0.065	0.232	Rejected	-0.105	0.407	Rejected	0.063	0.2	Rejected	0.133	0.42	Rejected
H8	PEOU	<---	SI	-0.046	0.39	Rejected	**-0.335**	**0.004**	**Accepted**	**-0.119**	**0.02**	**Accepted**	0.105	0.66	Rejected
H9	PU	<---	IQ	-0.013	0.894	Rejected	-0.127	0.618	Rejected	**0.233**	**0.002**	**Accepted**	0.077	0.16	Rejected
H10	PEOU	<---	IQ	**0.222**	**0.02**	**Accepted**	-0.086	0.681	Rejected	**0.466**	**0.002**	**Accepted**	0.009	0.91	Rejected
H11	PU	<---	SQ	**-0.046**	**0.009**	**Accepted**	0.221	0.22	Rejected	-0.036	0.318	Rejected	-0.144	0.1	Rejected
H12	PEOU	<---	SQ	-0.008	0.659	Rejected	-0.102	0.529	Rejected	0.022	0.519	Rejected	0.017	0.97	Rejected
H13	PU	<---	MS	**-0.071**	**0.002**	**Accepted**	-0.134	0.493	Rejected	**0.122**	**0.002**	**Accepted**	-0.421	0.12	Rejected
H14	PEOU	<---	MS	**-0.03**	**0.05**	**Accepted**	0.133	0.307	Rejected	**0.119**	**0.005**	**Accepted**	**-1.226**	**0.01**	**Accepted**
H15	PU	<---	FC	**-0.056**	**0.003**	**Accepted**	0.027	0.908	Rejected	0.019	0.526	Rejected	**1.324**	**0**	**Accepted**
H16	PEOU	<---	FC	**-0.051**	**0.002**	**Accepted**	0.124	0.236	Rejected	0.057	0.163	Rejected	**3.005**	**0**	**Accepted**
H17	PU	<---	UI	0.059	0.269	Rejected	0.155	0.201	Rejected	-0.055	0.176	Rejected	**-0.551**	**0**	**Accepted**

Hypothesis	Parameter			Results of Hypothesis Testing											
				Cumulative Hospital Data			Privately Owned Hospital Data			Government-owned Hospital Data			Regional Government-owned Hospital Data		
				Estimate	**p**	**Result**	**Estimate**	**p**	**Result**	**Estimate**	**p**	**Result**	**Estimate**	**p**	**Result**
H18	PEOU	<---	UI	**0.103**	**0.011**	**Accepted**	0.09	0.378	Rejected	**-0.115**	**0.018**	**Accepted**	**-1.491**	**0**	**Accepted**
H19	HISA	<---	EU	**0.492**	**0.002**	**Accepted**	**0.474**	**0.004**	**Accepted**	**0.538**	**0.002**	**Accepted**	**0.77**	**0**	**Accepted**
H20	HISA	<---	PU	**0.347**	**0.002**	**Accepted**	**0.389**	**0.002**	**Accepted**	**0.293**	**0.002**	**Accepted**	**0.26**	**0.01**	**Accepted**

Appendix 1

User Acceptance Factors	Indicators
Perceived Usefulness and Performance Expectancy	Using HIS would enhance my effectiveness in my job.
	I would find HIS useful in my job.
	Using HIS would improve my performance in my job.
	Using HIS at work would improve my productivity.
Perceived Ease of Use and Effort Expectancy	I would find the HIS easy to use.
	I would find it easy to get the HIS to do what I want it to do.
	It would be easy for me to become skillful in the use of the HIS.
	Learning to operate the HIS would be easy for me.
Compatibility	HIS usage does not change (according to) the way I work.
	HIS usage does not change (as appropriate) preferences of my practice.
	Applications can be used in accordance with the needs of the provision of services I provide.
Information Security Expectancy	Confidentiality, availability, and data consistency or validity is an important feature of the HIS.

User Acceptance Factors	Indicators
	HIS provides features that can prevent unauthorized people to access the data in HIS.
	HIS provides features that can prevent or reduce user errors to prevent medication errors.
	HIS provides features that can prevent unauthorized codification by an unauthorized person to protect the data in order to remain consistent or valid.
Self-efficacy	I can finish my work with HIS even though I have not used a system like this before.
	I can finish the job by using HIS if I have been using a similar system to do the same job.
	I was able to realize the results of training related to information technology or HIS so that I can use the HIS.
Social Influence	People who are important to me suggest using the HIS.
	I use HIS because my co-workers also use HIS.
	People who influence my behavior thought that I should use HIS.
Information Quality	The information output released by HIS is clear and easy to read.
	The HIS can provide correct and consistent information.
	The information covered in the HIS meets my work needs.
	HIS provides output in a format that is easy to understand.

User Acceptance Factors	Indicators
System Quality	HIS provides all the functions involved in completing my work.
	The HIS can be linked to or integrated with information from other systems.
	HIS has a fast response time.
	HIS provides services 24/7 or whenever I need.
Management Support and Leadership	Management instructed me to use HIS.
	Management provides a reasonable transition period from the old system to the new system.
	Management provides an adequate working environment, such as a fun workplace, a sufficient number of computers, appropriate workload, etc.
	Management gave support to innovate through the use of HIS.
Participation of End-users in the HIS Implementation Process	I get training related to HIS.
	I was involved in the communication process to socialize HIS.
	I was involved in designing HIS.
	I was involved in implementing HIS.
HIS Acceptance	I will use HIS for my work.
	I intend to use HIS in my work as often as possible.

User Acceptance Factors	Indicators
	I would invite colleagues to use HIS.
	I predict there are many opportunities to use HIS to do my work.

Appendix 2

Cumulative Hospital Data												
	UI	FC	COMP	MS	SQ	IQ	SI	SE	ISE	PEOU	PU	HISA
UI	**0.83**											
FC	0.75	**0.86**										
COMP	0.53	0.47	**0.85**									
MS	0.68	0.69	0.46	**0.84**								
SQ	0.63	0.59	0.46	0.61	**0.86**							
IQ	0.65	0.59	0.60	0.62	0.72	**0.88**						
SI	0.64	0.55	0.56	0.55	0.56	0.67	**0.83**					
SE	0.49	0.42	0.47	0.43	0.51	0.57	0.60	**0.83**				
ISE	0.53	0.45	0.47	0.54	0.62	0.72	0.48	0.50	**0.84**			
PEOU	0.61	0.54	0.60	0.59	0.65	0.80	0.62	0.65	0.71	**0.82**		
PU	0.52	0.44	0.57	0.47	0.55	0.69	0.56	0.47	0.71	0.64	**0.84**	
HISA	0.49	0.42	0.50	0.46	0.52	0.64	0.51	0.49	0.61	0.72	0.68	**0.88**
Privately owned Hospital Data												

	UI	FC	COMP	MS	SQ	IQ	SI	SE	ISE	PEOU	PU	HISA
UI	**0.83**											
FC	0.81	**0.88**										
COMP	0.55	0.57	**0.82**									
MS	0.70	0.84	0.52	**0.86**								
SQ	0.67	0.81	0.62	0.83	**0.86**							
IQ	0.53	0.73	0.62	0.79	0.86	**0.88**						
SI	0.73	0.69	0.59	0.66	0.70	0.62	**0.85**					
SE	0.50	0.51	0.51	0.49	0.58	0.52	0.59	**0.83**				
ISE	0.45	0.58	0.51	0.67	0.77	0.73	0.52	0.53	**0.87**			
PEOU	0.55	0.71	0.63	0.71	0.76	0.81	0.57	0.64	0.77	**0.85**		
PU	0.49	0.60	0.60	0.61	0.72	0.73	0.56	0.43	0.73	0.67	**0.86**	
HISA	0.45	0.57	0.53	0.57	0.64	0.66	0.49	0.47	0.64	0.73	0.71	**0.91**
Government-owned Hospital Data												
	UI	FC	MS	SQ	IQ	SI	SE	ISE	COMP	PEOU	PU	HISA
UI	**0.84**											
FC	0.66	**0.86**										
MS	0.45	0.51	**0.86**									
SQ	0.55	0.56	0.52	**0.87**								
IQ	0.58	0.59	0.67	0.64	**0.85**							
SI	0.49	0.43	0.61	0.45	0.65	**0.80**						
SE	0.52	0.56	0.70	0.57	0.71	0.75	**0.78**					
ISE	0.48	0.54	0.59	0.54	0.70	0.46	0.60	**0.81**				
COMP	0.40	0.36	0.41	0.36	0.49	0.45	0.52	0.36	**0.93**			
PEOU	0.49	0.56	0.68	0.58	0.78	0.58	0.77	0.67	0.48	**0.79**		
PU	0.44	0.48	0.60	0.47	0.66	0.53	0.64	0.68	0.47	0.63	**0.82**	
HISA	0.40	0.45	0.55	0.46	0.63	0.48	0.61	0.58	0.41	0.73	0.67	**0.85**

Regional Government-owned Hospital Data												
	UI	FC	COMP	MS	SQ	IQ	SI	SE	ISE	PEOU	PU	HISA
UI	**0.84**											
FC	0.77	**0.84**										
COMP	0.36	0.47	**0.93**									
MS	0.58	0.78	0.44	**0.79**								
SQ	0.54	0.61	0.30	0.60	**0.86**							
IQ	0.53	0.73	0.40	0.72	0.58	**0.81**						
SI	0.49	0.55	0.38	0.73	0.46	0.52	**0.81**					
SE	0.57	0.65	0.57	0.76	0.51	0.64	0.67	**0.77**				
ISE	0.54	0.68	0.32	0.64	0.54	0.62	0.44	0.55	**0.83**			
PEOU	0.49	0.71	0.42	0.74	0.58	0.71	0.48	0.73	0.62	**0.82**		
PU	0.50	0.65	0.46	0.66	0.43	0.60	0.47	0.59	0.63	0.58	**0.80**	
HISA	0.45	0.61	0.39	0.63	0.46	0.59	0.43	0.60	0.56	0.74	0.68	**0.86**